

REMARKS

I. Introduction

In response to the pending Office Action, Applicant has cancelled claim 9, without prejudice, and amended claims 1, 4, 10 and 36 in order to overcome the § 112 rejections and to further clarify the subject matter of the present invention. The limitations of claim 9 were incorporated into claims 1 and 36 and claim 10 was amended to be dependent upon claim 1. Support for the amendment of claims 1 and 36 may be found, for example, on page 12, lines 2-18 of the specification and original claim 9. No new matter has been added.

For the reasons set forth below, Applicant respectfully submits that all pending claims are patentable over the cited prior art.

II. The Rejection of Claims 1, 3-6 And 36 Under 35 U.S.C. § 102/103

Claims 1, 3-6 and 36 were rejected under 35 U.S.C. § 102(e) as being anticipated by or in the alternative, under 35 U.S.C. § 103(a) as obvious over Grandikota et al. (US Pat. Publ. No. 2002/0112964) in view of Applicant's Admitted Prior Art (AAPA). In addition, claims 2 and 9-11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Grandikota in view of the AAPA and in further view of Reid et al. (USP No. 6,551,487). As the limitations of claim 9 have been incorporated into claims 1 and 36, the § 103 rejection of claim 9 will be addressed. Applicants respectfully submit that Grandikota, the AAPA and Reid fail to anticipate the pending claims for at least the following reasons.

With regard to the present invention, amended claims 1 and 36 both recite, in-part, a method for plating a substrate or manufacturing a semiconductor device comprising the steps of: performing a first electrolytic plating process with respect to the substrate in a plating solution

until at least one of depressed portions provided in a surface to be plated having a minimum diameter is filled up; after the step of the first electrolytic plating process, rotating the substrate in the plating solution at a first speed of rotation and thereby removing a bubble adsorbed to the substrate; and after the step of removing the bubble, rotating the substrate in the plating solution at a second speed of rotation lower than the first speed of rotation and thereby performing a second electrolytic plating process with respect to the substrate, wherein the second electrolytic plating process is performed with the surface of the substrate to be plated faced downward and the substrate immersed in the plating solution, and a plate film is formed by the steps of the first and second electrolytic plating processes.

One feature of the present invention is the first electrolytic plating process in which an extremely small opening formed in advance can be filled up before the bubble removing step is performed in order to prevent a defect occurring during filling the plate film in the extremely small opening in the second electrolytic plating process with the high-speed substrate rotation. In other words, the first plating process is performed together with the second plating process and the bubble removing step, thereby forming the plate film.

In contrast to the present invention, neither Grandikota nor the AAPA disclose the feature of performing a first electrolytic plating process with respect to the substrate in a plating solution until at least one of depressed portions provided in the surface to be plated having a minimum diameter is filled up. Therefore, neither Grandikota nor the AAPA can achieve the above cited effect of preventing a defect occurring during filling the plate film.

The AAPA discloses that a pit defect of a lower-layer wire, resulting from performing a plating process with respect to the substrate to which bubbles are adsorbed, forms a depression

57 in the surface of the upper interlayer insulating film 56 (see, Fig. 13A). In the step of forming an upper-layer wire, the residues of the TaN film 59a and the Cu film 59b resulted from the polishing of a wiring material are filled also in the depression 57, thereby forming a faulty pattern (See Page 3, line 8-page 4, line 4).

It was alleged that the step of filling the TaN film 59a and the Cu film 59b disclosed in AAPA corresponds to the feature of the present invention wherein the opening with a minimum diameter formed in advance can be filled up before the bubble removing step is performed. However, in the AAPA, there is no description with regard to the step of forming the TaN film 59a and the Cu film 59b. Furthermore, the opening is not filled before the bubble removing step is performed. Thus, the step of filling the TaN film 59a and the Cu film 59b of AAPA is not the same as the step wherein the first electrolytic plating process is performed together with the second plating process and the bubble removing step. Accordingly, the AAPA fails to disclose the above mentioned step. In addition, Grandikota and Reid both fail to remedy this deficiency.

As is well known, in order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 580 (CCPA1974), and as the combination of Grandikota, the AAPA and Reid fails to teach or suggest a method for plating a substrate or manufacturing a semiconductor device comprising the steps of: performing a first electrolytic plating process with respect to the substrate in a plating solution until at least one of depressed portions provided in a surface to be plated having a minimum diameter is filled up, it is submitted that Grandikota, the AAPA and Reid, alone or in combination, do not render claims 1 and 36, or any pending claims dependent thereon, obvious.

**III. All Dependent Claims Are Allowable Because The
Independent Claim From Which They Depend Is Allowable**

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1 and 36 are patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

IV. Conclusion

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication of which is respectfully solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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